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ABSTRACT

The manual on problem solving was culled from a set of newspaper articles in the Philadelphia Inquirer. Each brief article typically suggests problem solving strategies and offers sample problems on which to test one's skill. Articles are organized into the categories of input, process, and output. The input section offers ideas about analysis, information, and relevance in examining problems. The process section offers specific strategies, suggests graphic organizers, and encourages creative invention and improvement. The section on output covers judgments and setting standards. Answers to selected problems are provided at the end. (DB)

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PROBLEM SOLVING

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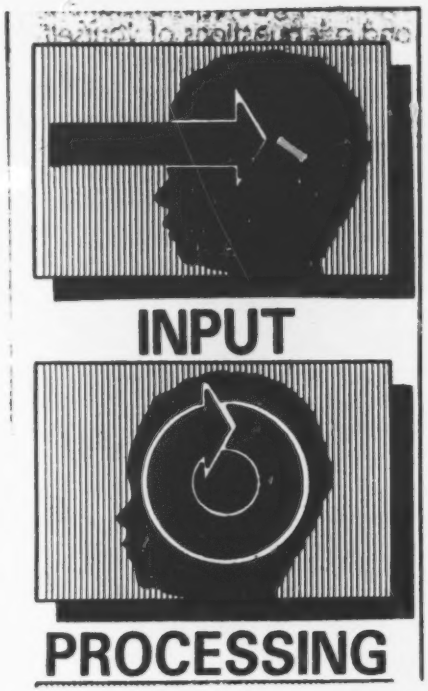
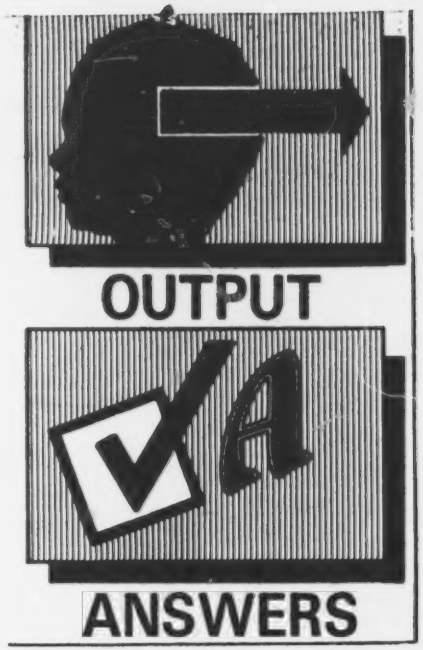
The Philadelphia Inquirer
A Newspaper in Education Supplement
Monday, April 10, 1989





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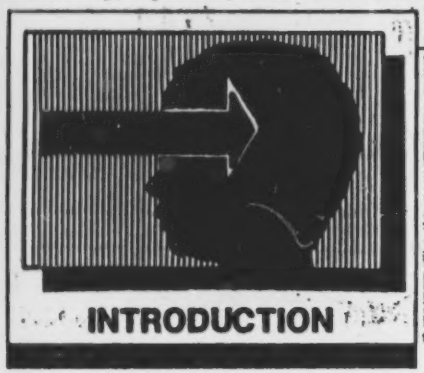

INTRODUCTION

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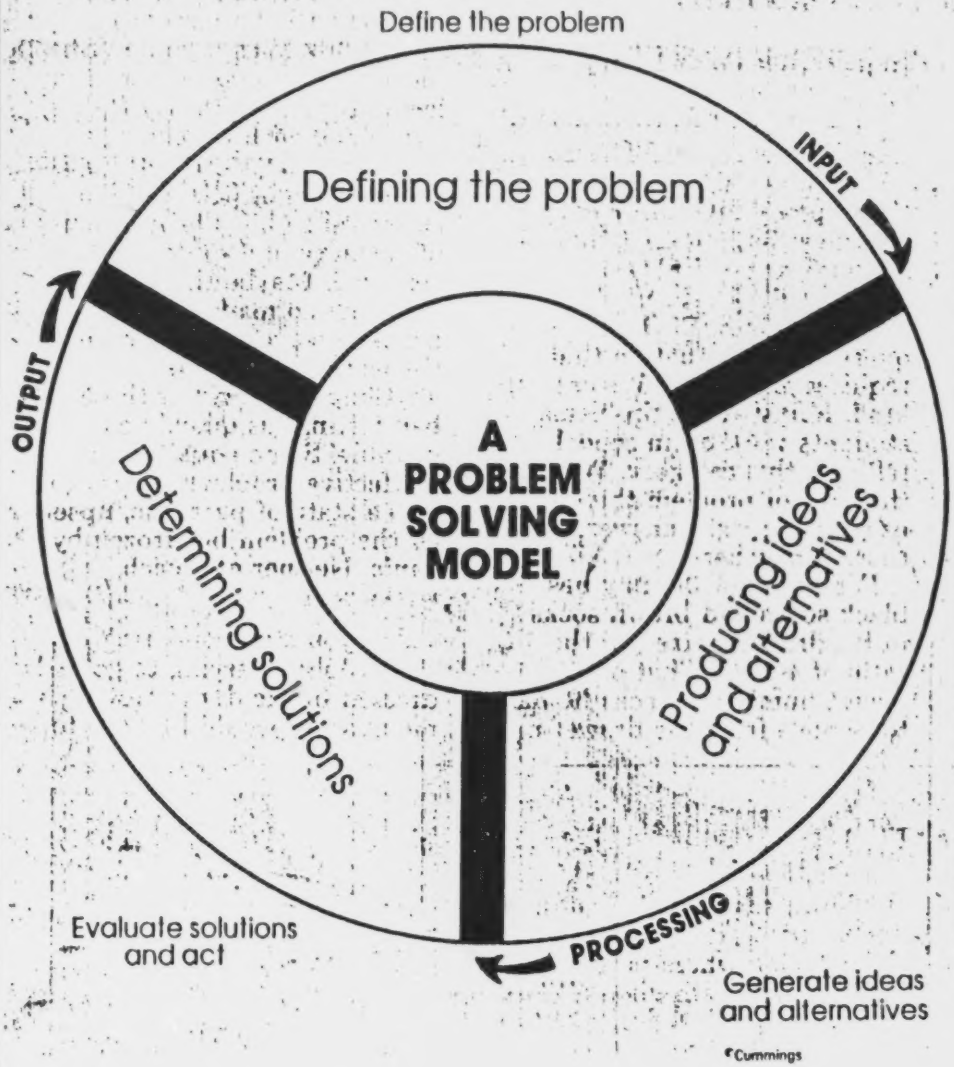


D.A. Norman, a psychologist, thinks that human beings process information in three stages. As you can see from this model diagram, this process is similar to the way a computer works with information.

The first stage is "input." This stage involves defining the problem. In order to accomplish that, you must analyze the situation, gather information, and ask questions of yourself.

In the second stage, "processing," you continue to focus on the problem and begin to think of options and alternatives, keeping your mind open to all the possible solutions.

"Output" is the third and final stage. At this point you evaluate the various options. You select the best option and come up with a plan of action — a plan that, when carried out, will get rid of the problem once and for all.

Start here!

Find out how you rate as a problem solver

Before you begin to learn more about problem solving, let's see what you already know about the process.

Answer the following questions honestly. This isn't a quiz. It is a beginning point, a way to start thinking about what it means to be an effective problem solver. Discuss your responses with your classmates.

1. Do you act upon the very first potential solution that pops into your head?

2. Do you gather few, if any, facts before actively working on a problem?

3. Do you tackle a problem without any overall plan in mind?

4. When brainstorming ideas in a group, are you the person who says, "No way! That will never work?"

5. When a problem occurs in your life, is your first instinct to take a long nap, hoping somehow it will all disappear?

6. Do you give up at the first sign of frustration?

7. When it's time to make a decision, do you rely on others to do it for you?

Tips for solving problems

Of course, there are no correct or incorrect answers to these questions. But, if you thought some of your answers indicated that you are not a top-notch problem solver, here are some tips for improvement.

Successful problem solvers:

- Read slowly and carefully, and then review what they've just read, looking carefully for important ideas and key concepts.
- Recall similar problems they have solved successfully in the past.
- Proceed slowly, step by step, gradually setting up a reasonable plan of attack.
- Apply a range of proven strategies to get closer to a solution. This may include drawing a picture or looking for a pattern. Sometimes breaking the problem into smaller pieces helps.
- Stop every so often to ask themselves: How is everything going? Am I making progress? Should I rethink my plan of action?
- Evaluate the solution to the problem by asking themselves: Is this answer reasonable? Is it accurate? Does it make sense?

You will have many opportunities to practice your problem solving skills as you work through this supplement. These tips may help.

What is a problem?

"To live is to have problems . . ."

--J.P. Guilford

We all have them. We all try to deal with them as best we can.

What exactly are they? Let's start with a definition.

A problem exists when someone senses a significant difference between what is and what could be — a discrepancy, a missed connection between reality and a wished for state of being. An obstacle (or two) might stand in the way of your particular goal.

For example: You come to school and suddenly realize at 10 a.m. that you left your lunch at home.

These types of problems are shared by everyone. There's no one magical solution to this type of "life" problem. The good news is that there are endless possibilities.

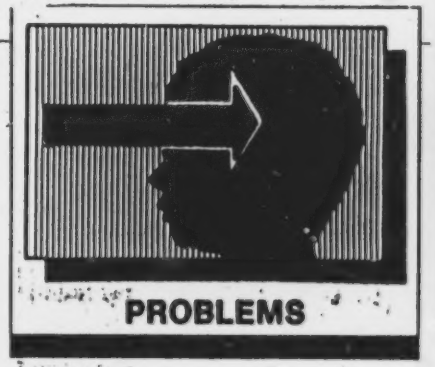
Or . . .

A problem could be a question or a situation that requires an answer of some kind. Many of the problems students work on in school fall into this category. With this sort of problem there's usually one right answer out there somewhere.

For example: Johnny has black socks and brown socks in his drawer, mixed in the ratio of 4 to 5. What is the fewest number of socks he has to remove from the drawer in the dark in order to have at least one matching pair?

Maybe the best way to define problems is to describe the way they make most of us feel. There's an uneasy feeling associated with problems, a nagging anxiety. Something is not quite right, the way it's supposed to be. Things seem off balance, not quite centered. Maybe that's why there are so many sloppy problem solvers out there in the world, eager to do anything to get rid of these bad feelings as quickly as possible. Some equally ineffective problem solvers go into a state of paralysis, upset by the problem but frozen by panic. Neither approach works well.

Are you still wondering about Johnny trying to get dressed in the dark? How many socks would he have to remove from the drawer? Turn to page 16 and check your answer.



What solutions can you list to the missing lunch problem?

school and suddenly realize at

To the teacher

'It is strange that we expect tudents to learn, yet seldom each them anything about earning.
'We expect students to solve roblems, yet seldom teach hem anything about problem olving."

--D.A. Norman

In today's complex world, memorizing facts and figures is no longer enough. No student — no teacher, for that matter — could possibly keep up with the information explosion.

To succeed in their personal and professional lives, students must learn critical and creative thinking. But, how can you teach someone how to think?

This supplement uses a variety of problem-solving techniques to develop those critical and creative thinking abilities.

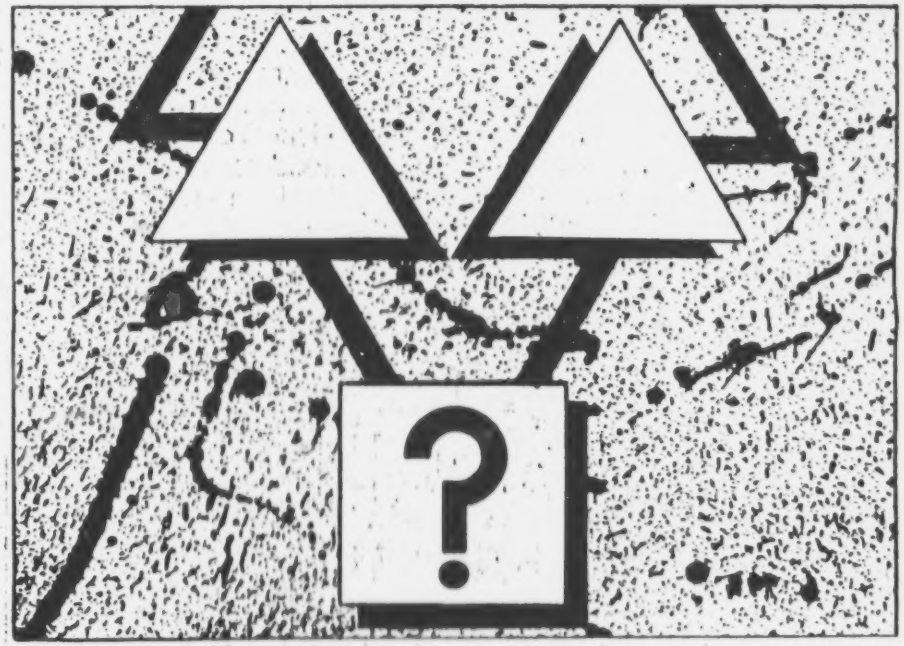
The supplement is organized with a specific model in mind. As you can see from the diagram on Page 2, the model depicts problem solving as a three-stage process similar to the function of a computer: input, processing, output. The three sections of the supplement correspond to those three stages.

Through the activities in the input section of the supplement, students will focus on defining problems: analyzing situations carefully before proceeding, gathering information where necessary, questioning themselves (What do I know? What do I need to find out?") for insight and direction. This is a starting point because clearly defining a problem increases the probability of solving it effectively.

Activities in the processing section offer the student a range of strategies for producing new ideas with a strong emphasis on creativity and group process.

The output section illustrates various decision-making models. How do you choose among a list of possible solutions? Which one will be most effective? How do you design a plan of action?

A range of educational research is reflected in this supplement. First and foremost, is the "brain as computer" model that hails from the field of cognitive psychology. (For more information on this approach, see *Human Information Processing*, by D.A. Norman. N.Y. Academic Press, 1977.) The section on creativity references the work of Sidney Parnes, Edward DeBono and W.J.J. Gordon. Other contributions will be credited throughout the supplement.



Don't be too hasty

There's a story that goes something like this:

A boy runs down the hall and almost collides with his science teacher, Mr. Siegel. The boy's name is Jeffrey and he is in a panic. Jeffrey has a problem.

"What's the matter?" asks Mr. Siegel.

"I need a ladder!" Jeffrey replies breathlessly.

"Why?" demands his teacher.

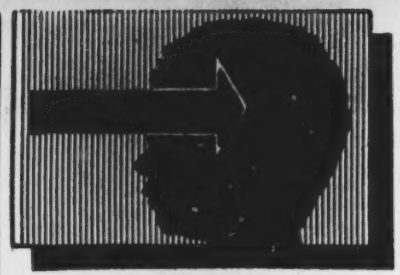
"To get my project down from the ceiling before last bus call."

Aha. The problem is clear to Mr. Siegel. And he determines a workable solution almost at once.

Jeffrey doesn't need a ladder. Mr. Siegel, who is 6 feet 3 inches tall, can easily stand on a chair to help Jeffrey retrieve his project in time to catch his bus home.

What went wrong here?

This story is an example of how problem solvers sometimes defeat themselves by focusing on a solution before they have properly defined the problem!



INPUT

Defining the problem

"We can have facts without thinking, but we cannot have thinking without facts."
–John Dewey

To define a problem, you must begin with a clear perception of the situation at hand. We call this the "input" stage.

Watch out, because in this stage it is sometimes easy to develop tunnel vision. Like our friend Jeffrey with a project just out of reach, we often focus on one solution and, in so doing, disregard all sorts of possibilities.

Effective problem solvers slow down the process by following these three steps:

1. Take the time to tune in all five senses to what is really going on.
2. Gather all the facts in the matter before proceeding.
3. Ask the right questions to determine the real problem.

Where is that problem?

An important step in the problem solving process is finding the problem.

And finding the problem is not always as easy as it sounds. Often, the real problem is hidden deep below the surface, out of reach. Discovering this sort of hidden problem requires some analysis on your part.

Sometimes, there might be many problems all jumbled together. In those cases, the problem solver needs to sort out and focus on the primary, most important problem.

You can learn to focus through practice. Here are some inventions and improvements currently on the shelves in your neighborhood stores. Your job is to find the problems that triggered the creation of these items.

Can you think of any other popular products or services invented to solve other problems that people have in everyday life?

PRODUCT	PROBLEM(S) ADDRESSED BY PRODUCT
1. Low-cal "cook-in-bag" dinner	
2. Low-sugar breakfast cereal	
3. Sunscreen lotion	
4. Soap with bath oil	
5. Decaffeinated soda	
6. Disposable diaper	
7. Microwave popcorn	
8. Phone answering machine	
9. Portable exercise bike	
10. One-serve drinks in a carton	
11. Vacuum bag freshener	
12. Ziploc storage bag	
13. Wrist and ankle weights	
14. Low-salt crackers	
15. Dryer fabric softener sheet	

Listen up and see if you can solve these riddles

Avoid developing tunnel vision by practicing careful listening and clear thinking. Can you solve these problems and riddles? Ask a partner to read the following eight problems aloud to you. There's only one logical answer for each. Check your answers against those that appear on page 16.

1. How many birthdays does the typical human being have?

2. Some months have 31 days; some have 30. How many have 28?

3. A farmer had 20 goats. All but 11 died. How many does the farmer have left?

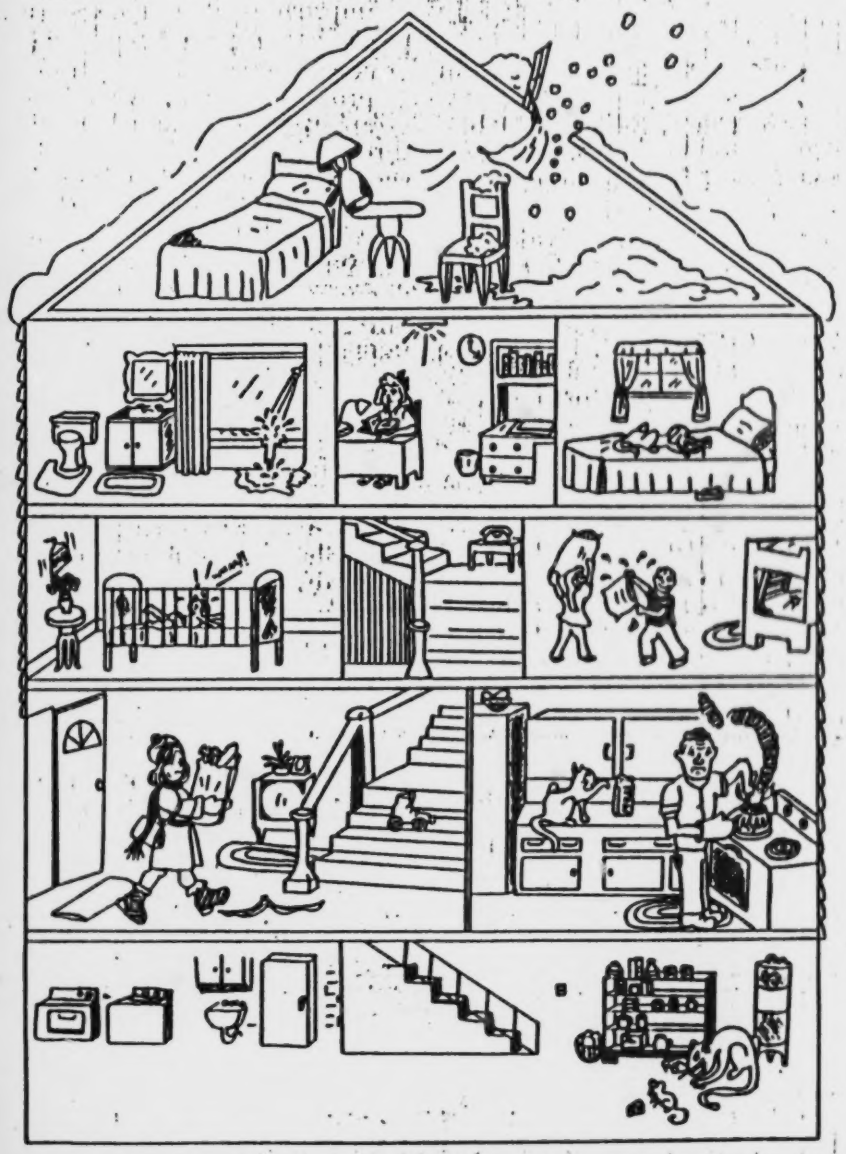
4. A girl goes to watch a horse race. The girl is the daughter of one of the jockeys, but the jockey isn't the girls' father. How can this be?

5. A man is in his car facing west. After driving for one mile on a perfectly straight road, and without turning the car, he finds himself one mile east of his starting point. How can this be?

6. A noted psychic can tell you the score of any baseball game before the game starts. How is this possible?

7. Identify the letter that is in the same position in the word "pardon" as it is in the alphabet.

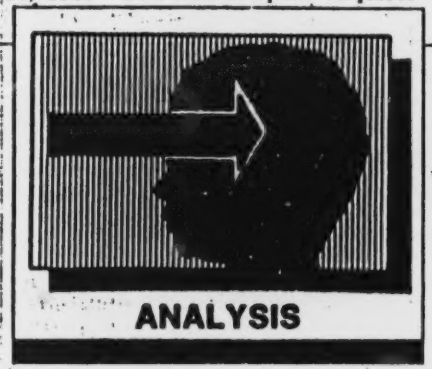
8. Water lilies double in area every 24 hours. At the beginning of the summer there is one water lily on a lake. It takes 65 days for the lake to become covered with water lilies. On what day is half of the lake covered?



Oh, no!

Take a look at the "House of Disaster." Test your skill at problem perception by completing the chart below.

In the first column, take note of problems that are occurring right now! In the second column, describe problems that are sure to develop in the near future. Can you tell the difference? Look carefully.



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IMMEDIATE PROBLEM	FUTURE PROBLEM
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

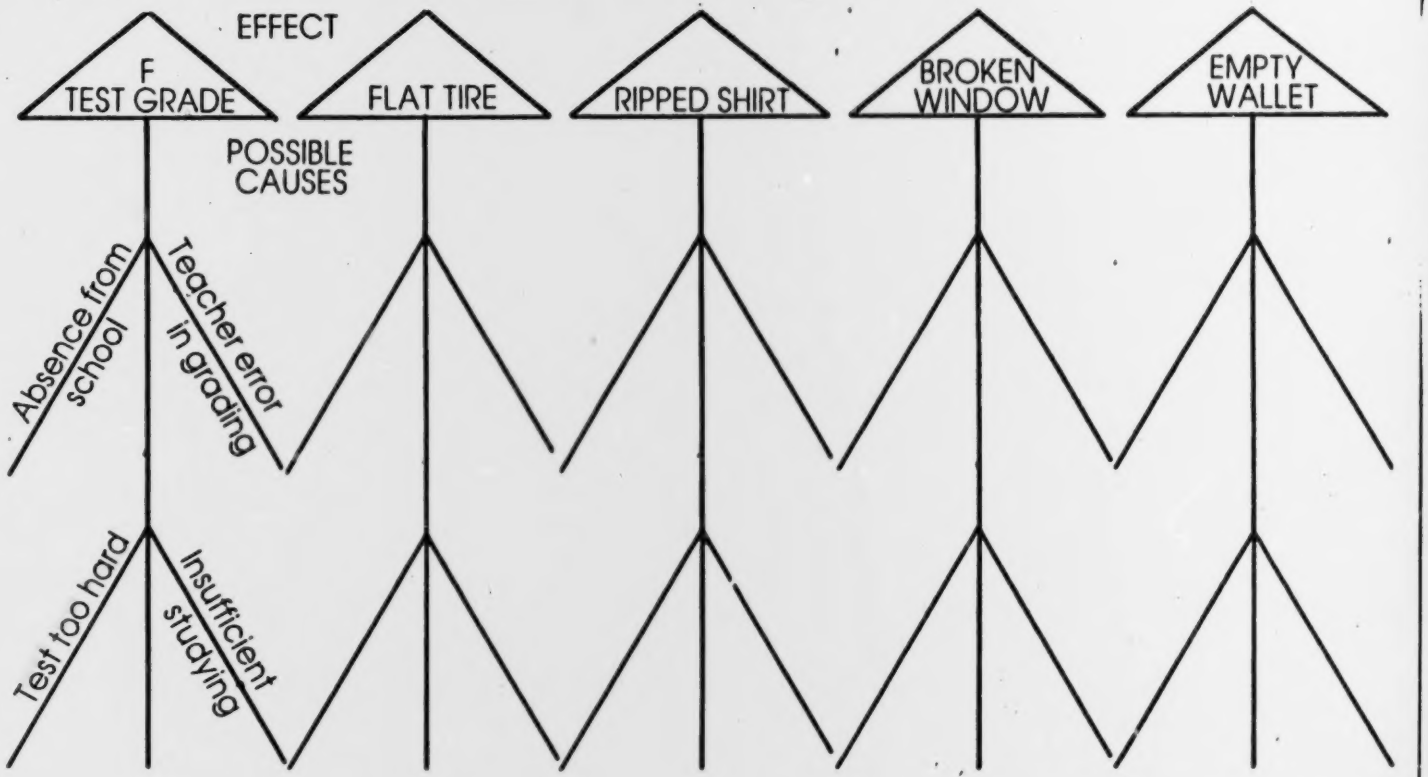
Cause and effect: What went wrong here?

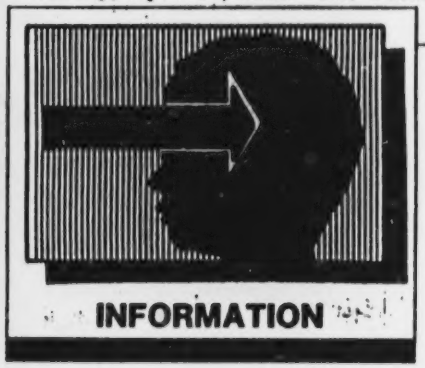
Sometimes the surest way to know there's a problem is to see the disastrous results right before your eyes: broken pieces of glass on the floor, a bloody nose, a mark of "F" on a test paper. Something brought about these unpleasant effects. What was the cause?

By definition, a cause is what creates the disaster. The effect is the final result — the disaster itself.

Warm up for problem solving by attempting to analyze the possible causes for the disasters listed at right. There are lots of possibilities!

Here are the effects. What were the possible causes? List the possible causes on the lines provided; add extra lines if you need them. The first problem has been done for you.





FIRE
Who
1.
2.
What
1.
2.
When
1.
2.
Where
1.
2.
Why
1.
2.
How
1.

Something's wrong with these problems

Problem-solvers need to spend time analyzing a problem thoroughly before proceeding with a plan of action.

Sometimes that analysis involves talking to yourself a little.

Effective problem solvers are people who constantly ask themselves questions. Questions such as:

What do I know?

What do I need to find out?

What information don't I need?

What's missing?

The last question — What's missing? — is an important one. To understand just how important, apply it to the problems below.

First, read each problem and decide what missing bit of information you would need to reach a solution. In the space provided, write a question asking for that missing information. The answers appear on page 16.

Problems

1. Karen wants to give a Valentine's Day card to each of her classmates. There are 10 cards in a package. How many packages should she buy?

2. Mrs. Smith is measuring her children one at a time. Sandra is 4 feet 7 inches. Billy is 5 feet 2 inches. Lisa is the youngest and the shortest in the family. How much taller is Billy than Lisa?

3. Jerry baked 150 cookies for the cake sale. He sold half of them on Monday. How much money did he make?

4. The gym teacher bought three volleyballs that cost $14 each, 12 baseballs that were four for $15, and $20 worth of tennis balls. How much money was left in the athletic department budget after these purchases?

5. Mrs. Shaffer just bought a new rug for her bedroom, which measures 15 feet by 10 feet. She wants an even border of hardwood floor all around the four sides of the rug. How much of the floor will be uncovered?

6. Jeff bought a ring that cost $1,532. How much did the jeweler charge him, including sales tax?

Learning to ask questions

Problem solvers are good at asking questions. How else can you get all the facts you need to devise a good solution?

Pretend you are a newspaper reporter covering the city beat. You have just arrived on the scene of a fire. The firefighters are already there. Think of questions you will have to ask to get the facts you need for your story. (Get to work. Your deadline is just two hours away!)

A visual organizer is provided above to help you remember the 5 W's and the H of good reporting — who, what, when, where, why, and how. Try to come up with at least two questions for each section.

Teacher alert!

Solving the mystery of the Black Box

To set up the activity, collect six empty boxes with lids. Then, look on page 16 for suggestions about items that can be placed in the boxes when your students aren't looking.

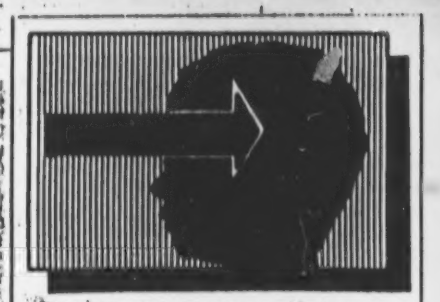
Pass the boxes around, encouraging students to think about what might be inside. They should focus on what they can hear as the items move around and on the weight of the box. Then, have them record their observations on the chart below. What can they infer about the box contents from the sound and from the weight? Record those inferences.

Discuss and then record possible conclusions.

Solve the mystery by unveiling the contents of each box one at a time after all guesses have been shared.

MYSTERY BOX 1 Observations: Inferences: Conclusion:	**MYSTERY BOX 2** Observations: Inferences: Conclusion:	**MYSTERY BOX 3** Observations: Inferences: Conclusion:
MYSTERY BOX 4 Observations: Inferences: Conclusion:	**MYSTERY BOX 5** Observations: Inferences: Conclusion:	**MYSTERY BOX 6** Observations: Inferences: Conclusion:

Perception and the eye of the beholder



In the story *The Blind Men and the Elephant*, six men draw six inaccurate conclusions about an elephant.

"It's a spear," says one, feeling the sharp tusk.

"No, this is a tree," argues another, trying to wrap his arms around one of the elephant's massive hind legs.

The story goes on. The elephant is mistakenly identified as a wall, a snake, a fan and a rope.

The moral of the story is that every individual perceives things differently. Each of us processes the world around us based on our experiences, attitudes, education, backgrounds and values. What does the "I" behind the "eye" really see?

As you consider the four situations described below, think about how perceptions of different people vary. Write a one-sentence response that would be typical of the person we have described. The first set has been completed as an example.

A candy bar as seen by:
a. a dieter
b. a dentist
c. a hungry 13-year-old

Response: "What a temptation! 300 calories!"
Response: "Sugar is bad for your teeth."
Response: "Delicious! Can I have another?"

Storm clouds as seen by:
a. a weatherman
b. a bride-to-be
c. a surfer

Response:
Response:
Response:

MTV as seen by:
a. a teenager
b. your grandmother
c. a classical musician

Response:
Response:
Response:

An overflowing garbage can as seen by:
a. a garbageman
b. an ecologist
c. a spy

Response:
Response:
Response:

A run-down, haunted-looking old house as seen by:
a. teenagers in the neighborhood
b. people living next door
c. a real estate salesperson

Response:
Response:
Response:

Determining what is relevant and what is not

Problems you solve in school are often packed with information — some of which you don't need to come up with a correct answer.

Effective problem solvers take the time to ask themselves, "Is there irrelevant information in this problem, information that I don't really need?"

For example:

One rabbit eats 3 pounds of food a week. There are 52 weeks in a year. How much food will six rabbits eat in one week?

Your answer: _____

Were you tempted to use all three numbers? Many problem solvers are. Given this problem to solve, one-fourth of the 13-year-olds participating in a recent survey multiplied 3 X 52 X 6. And, they arrived at a totally unreasonable answer. The fact that there are 52 weeks in a year is just not relevant.

Practice looking for relevant and irrelevant information with the following activity. First, read the following paragraph:

Sally gets paid on an hourly basis. She is trying to figure out whether or not her paycheck was correct. She did not work the same number of hours this week as last week. Her friend Jean is trying to help her. Which of Jean's questions are relevant to Sally's problem?

Read Jean's questions below. Then, circle the letters of the choices A through H that are relevant to solving Sally s problem. The answers appear on page 16.

A. How many hours did you work each day?

B. Did you get an invitation to Lou's party next week?

C. Does the payroll office often make mistakes?

D. Are you supposed to get overtime rates for some of the hours you worked?

E. Will you get the raise you asked for?

F. Will you be able to take part of your vacation next week?

G. How much is your regular hourly rate?

H Will the company do anything about it if you find out they made a mistake in your check?

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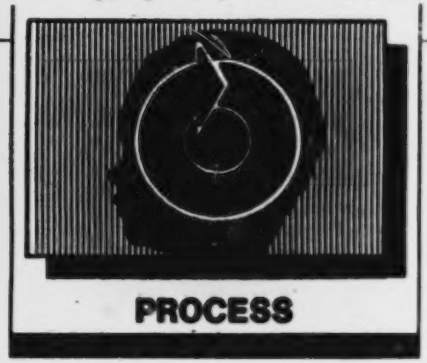


A storm in your brain

Brainstorming is one way to exercise your CQ (creativity quotient). Brainstorming is a fun way to generate long lists of ideas. Here are some rules to ensure effective brainstorming:

- Keep an open mind.
- Accept everything. Why kill an idea before it has a chance to blossom?
- Speak one at a time.
- Keep a running list of everybody's ideas.
- "Hitchhike." It's okay to add to other people's ideas.

Creativity: finding the key to new ideas

"The best way to have a good idea is to have lots of ideas."
--Linus Pauling

Producing ideas, one of which will become a real solution to a problem, is an essential step in the problem solving process.

The question then becomes: "How do you come up with great ideas?"

The key to producing ideas and alternatives involves tapping your creativity.

And that raises another question: What is creativity?

Creativity requires:

Fluency: producing many ideas

Flexibility: producing different ideas

Originality: seeing the problem in a way no one else has thought of

Elaboration: expanding, elaborating and building upon ideas

Creativity is not a limited, fixed ability. The good news is that, with practice, we can all improve our creativity skills.

How did geniuses throughout history come up with their ideas? The research on creativity is filled with interesting anecdotes:

Did you know that:

- Scientist Fredrich Kekule had a dream about a snake holding its own tail. He awoke suddenly. Shortly thereafter, he proposed a revolutionary idea: that the molecules of certain organic compounds form closed chains.

- Charles Dickens wrote his books while facing north, believing that the magnetic forces of the North Pole stimulated his thinking.

- Beethoven poured cold water over his head for musical inspiration.

- George de Mestral, a Swiss engineer, removed burrs stubbornly sticking to his clothing and, eight years later, invented Velcro fasteners.

Letters to the editor

Most newspapers publish letters to the editor on a regular basis so that readers can express their feelings and opinions about issues that are important to them.

Read the Letters to the Editor in today's Inquirer. Find a letter that discusses at least one problem and proposes at least one solution. Then, answer the following questions.

1. What is the problem? Is there more than one?

2. Who is most affected? How?

3. Why did the author write this letter?

4. What solution is suggested in the letter?

5. Underline the facts included in the letter.

6. Circle the author s opinions.

7. Can you think of a different solution to this problem?

Follow up

Is there a problem in your neighborhood that you feel strongly about? Write a letter to the editor outlining the problem and some possible solutions.

Visualization: picture it

Effective problem solvers use every tool at their disposal. One trick of the problem solving trade involves using pictures: graphs, charts, visual organizers, mental images, even doodles! This is called "visualization."

Visualization or picturing strategies can help you organize, manage, and make sense of the problems.

To see how it works, consider the following problem and the grid that can help solve it.

Gerry, Holly and Joe each ate something different for breakfast. One had cereal, one had eggs, and one had French toast. Joe did not have eggs or French toast. Holly did not have eggs. What did each person eat?

Problems like this can give you a major headache unless you use a grid like this one to bring them under control.

The grid works like this:

Joe did not have eggs or French toast, so put an "x" in those boxes. By process of elimination then Joe must have had cereal; place an "o" in the cereal spot by Joe's name. Now, if Joe had cereal, neither Holly nor Gerry did. Under each girl's name, place an "x."

Next clue: Holly did not have eggs. She must have eaten French toast; place an "o" under French toast for Holly.

So, who ate the eggs?

	Cereal	Eggs	French Toast
Gerry			
Holly			
Joe			

The grid to success

You can use the grid below for Problem #1. If you want to continue to Problem #2, make your own grid on another piece of paper. Then you might want to write a problem of your own and try it out on a friend.

The answers to these two problems appear on page 16.

Problem #1

Larry, Cheryl and Bob liked to eat different foods for breakfast. One liked to eat muffins, another toast and another bananas. Larry did not like to eat either muffins or bananas. Cheryl did not like to eat muffins.

Who liked bananas?

Problem #2

John, Peter and Michele play on the high school intramural soccer team. One plays goalkeeper, another is center halfback, and the other is center forward. John and the goalkeeper both celebrated Michele's birthday with her. John is not the center halfback.

What position does each person play on the soccer team?

Strategies for steering around a mental roadblock

Sometimes, when people brainstorm for a time, they begin to run out of ideas. Researchers who study creativity describe this as "hitting the wall." What a frustrating feeling! What do you do then?

Incubation

When this happens, one strategy is to walk away from the problem completely. Taking time out gives the brain a chance to relax and, at the same time, to subconsciously process new ideas. This strategy is called "incubation." After the brain incubates the problem for a time, new and exciting ideas seem to appear almost magically. Creativity researchers refer to this as an "Aha" or "Eureka" experience. Has a great idea ever occurred to you out of the blue, maybe while you were brushing your teeth?

Imaging

Another strategy — "imaging" — taps the brain's power to create strong mental pictures.

Consider the following problem and see how imaging works.

Suppose two people are playing golf. Close your eyes and picture a sunny day. And miles of manicured greens. And little flags fluttering at each hole. Suddenly, one player swings and the ball lands in a hole 10-feet deep. How can he retrieve the ball and continue the game?

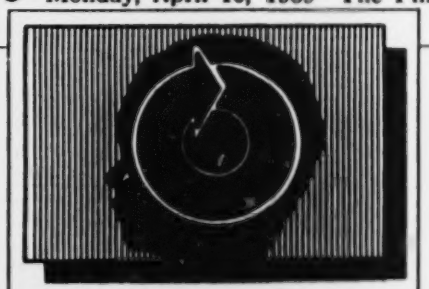
Picture the golf ball. Round and white, wedged in that space deep in the ground. Picture it rising up. Higher and higher. Out of the hole!

How did it get out? When you are ready, open your eyes and work with a partner to list — on a separate sheet of paper — as many solutions as you can.

You have just used the imaging strategy, which involves closing your eyes and focusing intensely on a "mental movie" of the problem.

Imaging helps you relax. Relaxing helps the brain work more effectively. It is very difficult to think creatively when you are feeling stressed or anxious.

If the imaging idea feels comfortable, use the technique next time you prepare for a big test. Review your notes in your mind's eye. Create visual pictures. As you take the test, close your eyes and recall these same mental pictures. Many students use imaging as part of their solution to the problem of getting good grades in school!

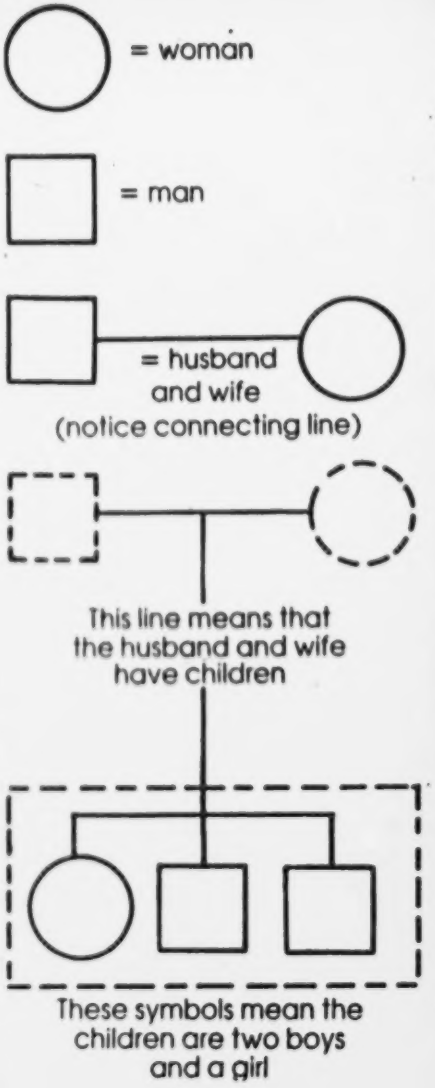


GRAPHIC ORGANIZERS

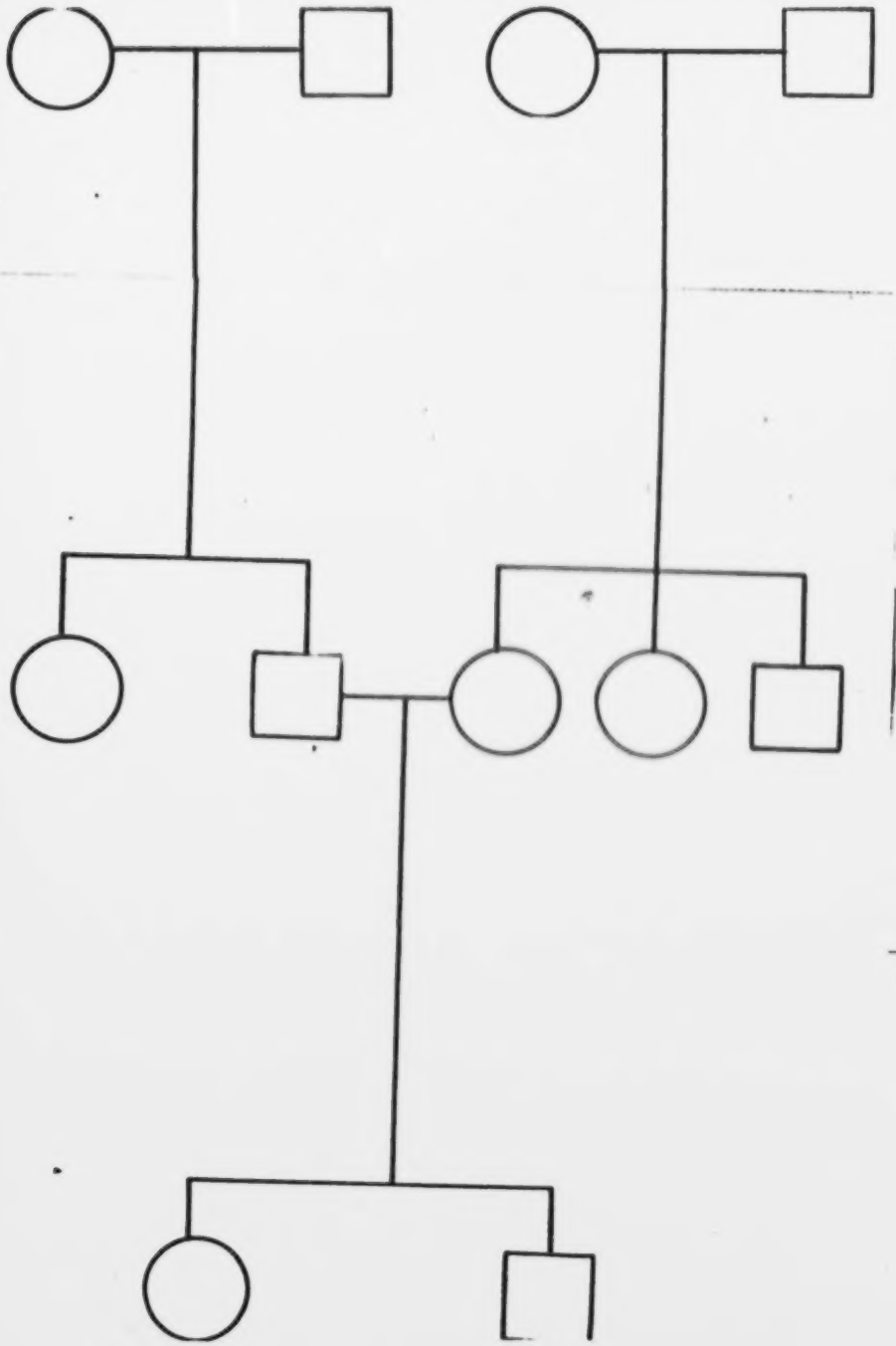
Family trees

Family trees are used to trace geneology, to show relationships within a family from one generation to the next. Family trees help organize relationships between husband and wife, parent and child, sister and brother.

This family tree uses the following symbols:


= woman
= man
= husband and wife
(notice connecting line)
This line means that the husband and wife have children
These symbols mean the children are two boys and a girl

Now that you know the symbols, use the following clues and the family tree to sort out this family. When you finish, answer the questions. Check your answers against those on page 16.



Clues:

1. Ivan Jones married Betty Green, and they have two children named Charles and Helen.
2. Charles Jones was named for his grandfather on his dad's side of the family.
3. Helen Jones was named for her mother's sister.
4. Ivan's sister and mother have the same name.
5. Charles has an aunt named Elizabeth.
6. Arthur and Grace Green have three children.
7. Betty Green has a brother named David.

Questions:

1. Helen Jones has two grandfathers. Name them:

_____

2. Charles has an uncle. Name him:

_____

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Problems in the newspaper

The newspaper is filled with examples of the problem solving process at work, from front page news stories describing international conflicts to the trials and tribulations of Ann Landers' readers.

In the article reprinted below, the Inquirer presented a problem — a difference of opinion.

Read the story and answer the following questions. When you finish, find stories in today's Inquirer that discuss problems. Analyze the articles by applying these same questions.

1. Where did this problem surface?
2. What is the problem?
3. What does each side want?
4. What arguments or evidence support their points of view? Who has a stronger case?
5. What do you think would be the ideal solution? Why?
6. What do you predict will happen next?

Two pandas arrive at the Toledo Zoo

United Press International

TOLEDO, Ohio — A pair of rare Chinese pandas whose visit to the United States sparked a court challenge by wildlife groups arrived yesterday for a 100-day stay at the Toledo Zoo.

The 8½-year-old pandas, named Le Le and Nan Nan, will be given about a week to adjust to their new surroundings before they are put on public display, zoo spokeswoman Betsy Clark said.

The World Wildlife Fund and the American Association of Zoological Parks and Aquariums were unsuccessful in obtaining a temporary restraining order that would have prevented the animals from leaving China on Friday.

The conservation groups say panda exhibits amount to commercial exploitation of the endangered animals.

How is a book like a shoe?

"The man with a new idea is a crank until the idea succeeds."
-- Mark Twain

Inventors are problem solvers.

They sense a situation that could be changed for the better. Then, they devise a way to improve that situation.

Inventors think of ideas that do not occur to other people. Inventors dare to be different! People may mock an inventor's seemingly wacky ideas at first. But, when the inventor's idea is accepted, the laughter turns to applause. Albert Einstein understood this. He once wrote: "A thought that sometimes makes me hazy: Am I or the others crazy?"

Getting inventive

Putting two things together that don't usually go together can be a way to trigger creative thoughts.

W.J.J. Gordon, one of the best-known researchers on the subject of creative thought, coined a new word to describe the act of forcing associations between unrelated objects or things. He called this process "synectics."

For example, how is a book like a shoe?

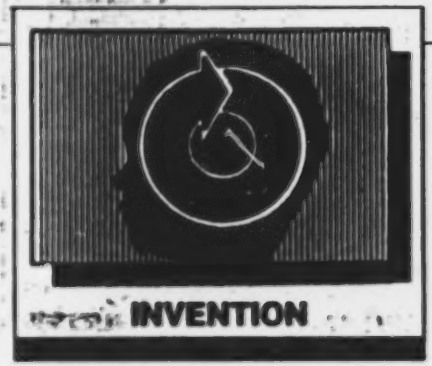
Think about that for a moment or two.

Hmmmmm . . . On the outside they can be different colors . . . And they do come in different sizes . . . Let's see . . . You have your favorites . . . They get comfortable over time . . . Hey, can't they take you places?

On a separate sheet of paper, list five other ways that a book and a shoe are alike.

Now that you have warmed up, list at least five similarities between the following pairs.

1. How is a pencil like a song?
2. How is a classroom like a plant?
3. How is a TV like a snowflake?



4. How is a house like a flower?
5. How is a bird like a lightbulb?
6. How is a table like a glove?
7. How is a dragon like a picket fence?
8. How is a monkey like a typewriter?
9. How is ice cream like a rainbow?
10. How is a rainstorm like a machine?

Scamper your way to new and creative ideas

Inventors sometimes "SCAMPER" to come up with creative ideas. SCAMPER is an acronym for seven basic thinking processes that researchers Bob Eberle and Alex Osborn consider essential to creative thought. The graphic you see here shows how scampering works.

Scampering helps inventors look at an everyday object from a different point of view, from a unique vantage point.

For fun, think about a paper clip that is "magnified" to 6 feet. What could you do with it? How about furniture made from rubber? (Substitution.) How would it feel? Where would you put it? Walk through any shopping mall and take a look at the latest gimmicky impulse items for sale near the store's cash register. There's a good chance that the inventors of some of these items knew how to scamper.

A pen is a pen is a pen . . . but you have probably spent money on a pen that:

(Substitute) bends into a pretzel shape.

(Combine) features a cartoon character on the eraser.

(Adapt) twists into the shape of a pretzel.

(Modify) writes in perfumed ink.

(Rearrange) is filled with floating plastic toys.

(Minify) is 3 inches high.

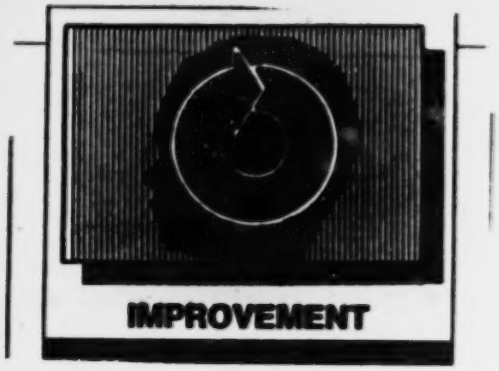
The basic pen has been transformed by creative people who have scampered all the way to the bank.

How has the basic sneaker been scampered? Ask your parents what sneakers used to be like when they were kids.

Try scampering with one of the following objects:

umbrella
fork
sweatpants
magnet
television
jeans
telephone
balloon
notebook
watch
coffee cup
computer

S	**Substitute**	What person, thing or material could be used instead?
C	**Combine**	What could be added or brought together?
A	**Adapt**	How could it be adjusted or reshaped?
M	**Modify** **Minify** **Magnify**	How can it be altered? In shape, size (larger or smaller) weight, taste, odor?
P	**Put to other uses**	How else can it be used?
E	**Eliminate**	What can be removed to make it simpler?
R	**Reverse** **Rearrange**	Turn it around? Upside down? Backwards? How can the order or sequence be regrouped or redistributed?



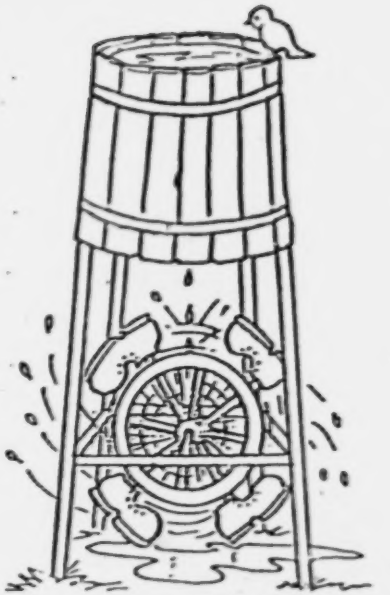
Uncle Walt's birthday present

Experiment with these new techniques and try brainstorming the following problem.

It's your birthday. Uncle Walt, your favorite relative, is invited to your party. The good news is that he shows up. The bad news is that Uncle Walt's birthday present for you is one of his latest wacky inventions. He calls it "The Thing." You have no idea what to do with it. What could "The Thing" possibly be used for?

So, after the birthday candles are blown out and all the guests have gone home, you decide it's time to find some creative uses for your birthday present.

Work alone or in teams to brainstorm as many different uses for "The Thing" as you can. Keep a list on a piece of paper. Do a good job and Uncle Walt may hire you as an inventor's apprentice!



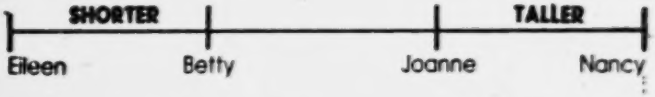
Getting in line

Sometimes problems focus on a particular dimension: weight, age, size, distance, order of events. Such problems can be confusing to read and solve unless you draw a picture. A useful strategy for this type of problem is a "linear representation."

Here's an example:

Betty is shorter than Joanne. Nancy is taller than Joanne. Eileen is shorter than Betty.

Is Joanne taller or shorter than Eileen?

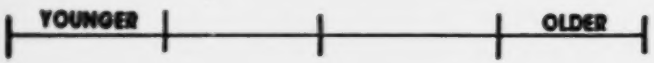


Drawing a line, labelling the opposites — in this case shorter and taller — and placing the names at different points on the line can help sort out a problem. The answer to this problem becomes obvious: Joanne is taller than Eileen.

Try solving the following problems using the linear representations provided. The answers appear on page 16.

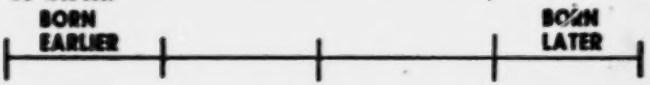
1. Jim is five years older than Fred. Gary is four years older than Jim. Tim is two years younger than Gary. Aaron was born 18 months after Tim.

Who is the youngest?



2. Although Gallagher preceded Baggs as mayor, he succeeded him in birth. Levy succeeded Ivory in both mayorship and birth but preceded Walden in both. Gallagher preceded Ivory in both mayorship and birth.

Write the names of the five mayors in order of birth.



3. Lisa likes to study the hardest subject first. She thinks that history is harder than English. There's no doubt in her mind that science is easier than home economics and that English is more difficult than home economics.

Which subject will Lisa study first?

4. If Rosemary and Lynda are both more athletic than Ivy, and Audrey plays fewer sports than Rosemary but more than Linda, who is the least athletic of the group?

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Hoagie baggies and other bright ideas

Some inventions are not brand new, they are merely improvements, slight changes that make something work differently — hopefully better.

Improvements come about when someone identifies a problem and comes up with a creative solution. Have you noticed that some dry cereals have resealable tops to keep the contents fresher longer? Now, that's an improvement.

Here are some other examples:

Problem:
When I eat hoagies, the sandwich begins to leak from the bottom once I get past the middle part.

Solution:
The HOAGIE BAGGIE! A food storage type of bag that slips neatly over the bottom of the sandwich and keeps all the good stuff inside until I can eat it.

Problem:
My room is always a mess. I hate it when company comes and I have five minutes to make the place presentable.

Solution:
The CLEAN SCREEN. A life-size photograph of what my room is supposed to look like (everything neatly put away, bed made, etc.) on a roller that pulls across the length of the room. (Fool your relatives and friends!)

Challenge your invention and improvement skills with the following problems.

Take your best improvement, create a name for the product and write an advertisement for it for the newspaper or radio.

Problem:
Each time the cat uses the litter box, little pieces of litter get all over the floor.

Solution:

_____

_____

_____

Problem:
Whenever I read the newspaper my fingers get covered with ink.

Solution:

Problem:
I can never find my keys in the bottom of my pocketbook or gym bag.

Solution:

Problem:
I hate loading and unloading the dishwasher.

Solution:

Problem:
I always run out of tape when I use the VCR to record a movie from television.

Solution:

Problem:
I either over-water or under-water my houseplants. Either way they die.

Solution:

Where did you put those darn keys?

Suppose one afternoon you come home from chool, walk up to the front door and realize hat you can't get inside.

You have lost your house key!

Here are four possible solutions to this roblem. (There are more than four solutions o this particular problem, but for right now, ocus on judging these four).

olution 1: Break a window.
olution 2: Wait until someone comes home.
olution 3: Go to a friend's house.
olution 4: Retrace your steps back to school nd look for the key.

One way to begin the process of decision aking is to think about the pros and cons of a ossible solution. The pluses, or positive spects, can be weighed against the minuses, or egative aspects, of a potential choice. Let's valuate the first solution:

olution 1

reak a window

ROS +	CONS -
et in quickly	Hurt yourself
o it yourself	Damage property
	Parents will be mad
	Cost money to

You are still locked out of the house. What a mess! It's getting dark and your stomach is starting to rumble. Or is that the sound of thunder in the distance? Is it going to rain? What a problem, with more problems on the way as the moments tick by and the door remains locked.

The consequences, or effects, of being alone and locked out of your house are basic:

- hunger
- discomfort
- fear.

Maybe it's time for another look at these four solutions. At this point you have considered the pros and cons. Continue the decision making process by thinking about the consequences of choosing one solution over another. That is, what effect or impact the solution would have.

Solution 1

Break a window	CONSEQUENCES
	Suppose the police see me and think I'm a burglar?
	Suppose I really cut myself badly and can't get help from a doctor?

Solution 2
Wait until someone comes home

PROS + CONS -

Solution 2

Wait until someone comes home — **CONSEQUENCES**

Solution 3
Got to a friend's house

PROS + CONS -

Solution 3

Go to a friend's house — **CONSEQUENCES**

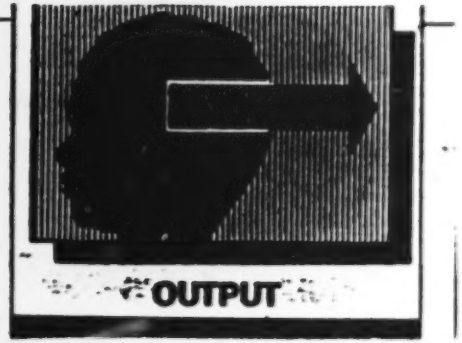
Solution 4
Look for the key

PROS + CONS -

Solution 4

Look for the key — **CONSEQUENCES**

Now, what will you do?



Priorities and values

What do you value? What is important to you?

What do these two questions have to do with problem solving?

So far, we have analyzed problems and practiced generating different creative solutions. How do we select one solution over another?

It's time to make a decision, a choice.

When we make a decision we are guided by those things that we value, believe in, or consider important.

Read the following list. Then, number the items from 1 to 8, with 1 being the most important and 8 the least.

Think about why you numbered the list as you did.

What do you value?

What is important to you?

Money

Happiness

Friends

Family

Love

Fame

Food

Cryptogram

A cryptogram is a word puzzle where one letter stands for another. It's up to the problem solver to crack the code.

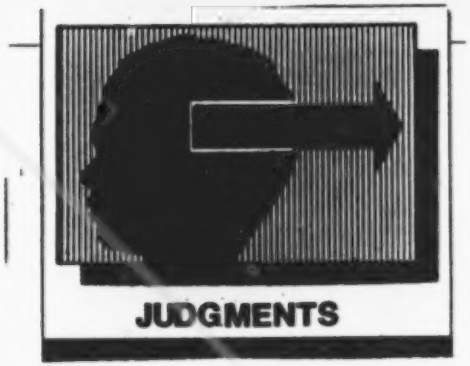
The solved puzzle here is a quotation. (P.S. It is also good advice for problem solvers.)

"LI ABZE SGOBJ LGIB

LI UQI DABKQABSIF

LOSG U RQAWZIN"

CLUE: The quotation comes from educator John Dewey, also known as CAGB FILIE!



Goldilocks: Delinquent or waif?

Decision makers are judges. They decide whether something is good or bad, right or wrong.

Sometimes when you try to decide how to solve a problem, it's useful to think of yourself as being like a judge in a court of law: getting all the facts, weighing the pros and cons, ultimately making an informed decision.

Here are three famous stories, each with a new problem, a new question for you to consider.

Was Goldilocks a hungry, tired little girl looking for food and comfort?

Or a juvenile delinquent guilty of trespassing and destruction of property?

Put Goldilocks on trial, assign roles, present character witnesses and reach a judgement.

Were the Three Little Pigs victimized by unscrupulous building suppliers?

Or, was the Big Bad Wolf a homeless vagabond driven to violence by hunger and other needs beyond his control?

Put the Big Bad Wolf on trial with your classmates acting out the parts. What's the verdict?

Decision trees

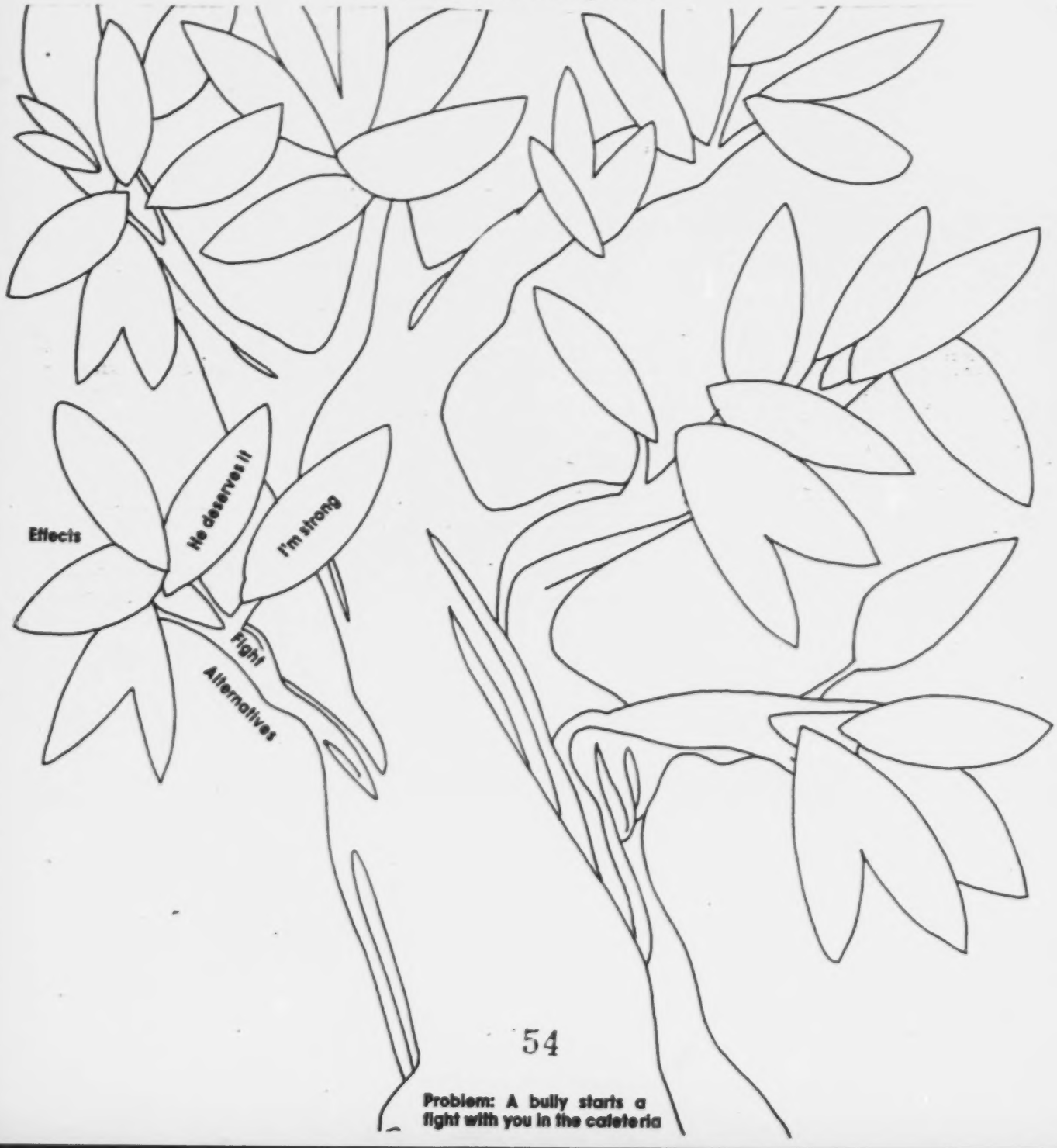
Decision makers often use decisions trees, another strategy that can help you make up your mind when it comes time to select a plan of action. Here's how it works:

Describe the problem at the base of the tree. The branches are possible courses of action. The leaves are reactions to each option: pros, cons, consequences, gut feelings.

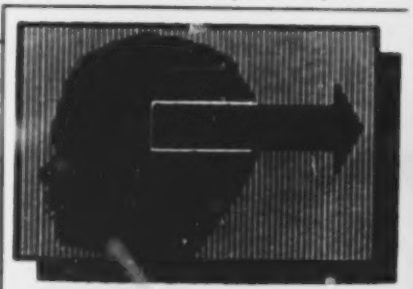
We have started a sample decision tree. What can you add to our tree? Think about the last time you had a problem like this. Talk with a classmate about other possible choices and their consequences.

Here's another problem: Suppose you win the lottery. Your prize is $1 million! What would you do with the money? What would be the consequences of your actions?

Fill in your own decision tree.



The Great American Chocolate Chip Cookie Taste Test Or . . . determining criteria



criteria (kri-ter' ea), [noun] standards of judgment or criticism: established rules or principles for testing anything for purposes of making decisions

— Random House Dictionary

Decision makers need to be aware of why they make the choices they do. They need to know what standards influence a decision.

Decision makers' standards, rules or guiding principles are known as "criteria."

Let's join a brother and sister in the neighborhood supermarket. They are about to have a fight in the cookie aisle.

"Let's buy a bag of Homebaked Delight chocolate chip cookies," the sister says. "They taste just like the cookies grandma bakes."

"Forget it," says her brother. "We're getting Munch-a-Crunch. They have 50 chips in each cookie. Don't you ever watch their commercials on TV?"

Hold on. Stop the action. Let's avoid a battle in aisle 6. Help these two by brainstorming. What makes a good chocolate chip cookie? Write your ideas on the lines radiating from this cookie.

When you finish, consider your responses. Group them into categories. What makes a good chocolate chip cookie? Chances are some of your criteria include:

- taste
- texture
- appearance

Now, back at the supermarket.

"I am sick and tired of having this fight with you every time we go shopping," the sister complains. "Let's solve this problem once and for all!"

"How?" asks the brother.

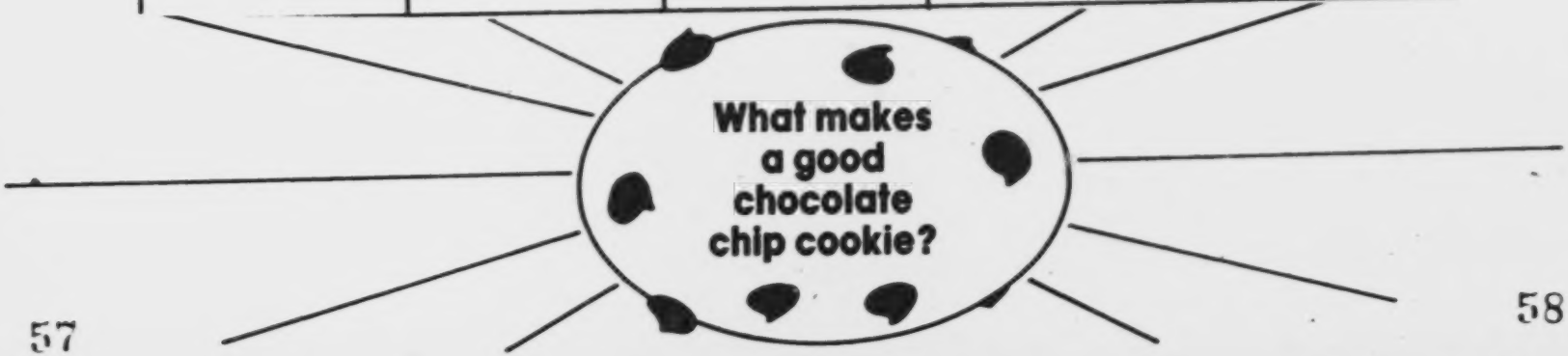
"Let's have a taste test and see which cookie wins," the sister suggests.

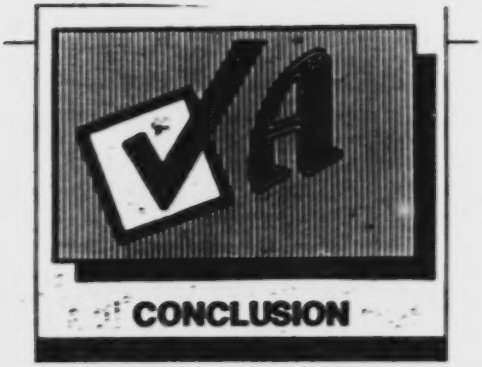
So, they take home a bag of Homebaked Delight and a bag of Munch-a-Crunch, and the Great American Chocolate Chip Cookie Taste Test begins.

Select a food and conduct your own taste test. List the food items in the first column. Determine three criteria and list those in columns two, three and four. Rate the items on a scale of 1 to 5. And the winner is . . . (The chart will work with sneakers, candidates for student government, movies, etc.)

Scale 1-5 (Poor to Excellent)

Name				Totals





Credits

This supplement was created by Alysa Cummings, an instructional specialist with the New Jersey Department of Education, Regional Curriculum Services Unit-South. The articles and activities in the supplement were either written by or selected by Cummings.

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The Newspaper in Education program offers a variety of programs and products for students and teachers:

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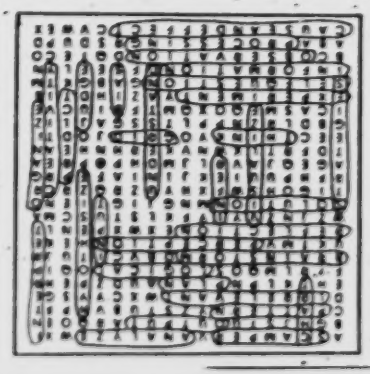

Answer key

Page 3

Sock drawer

1. three socks

Page 4

Solve the riddle

1. One a year.
2. All 12 of them.
3. 11.
4. The Jockey is the girl's mother.
5. He drove the car in reverse.
6. 64 days.
7. d.
8. Before the start of any game the score is 0-0.

Page 6

Black Box

Fill each of six boxes with:

- 10 cotton balls
- 25 paper clips
- ½ pound uncooked macaroni
- five pennies
- a bag M & M's (open)
- 5 ounces water in a baby food jar

Page 6

Missing information

1. How many students are in Karen's class?
2. How tall is Lisa?
3. How much did Jerry charge for each cookie?
4. How much money was in the Athletic Department budget to begin with?
5. How big is the rug?
6. What percent sales tax is there?

Page 7

What's relevant?

A, D, G

Page 9

Picture this

Gerry ate eggs.

The grid to success

1. Cheryl liked bananas.
2. John, center forward; Peter, goalkeeper; Michele, center halfback.

Page 10

Family tree

1. Charles Jones and Arthur Green
2. David Green

Page 12

Getting in line

1. Fred
2. Baggs, Gallagher, Ivory, Levy, Walden
3. History
4. Ivy

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Cryptogram

"We only think when we are confronted with a problem."

Find the hidden words

Do you know the vocabulary of problem solving?

There are 34 problem-solving terms hidden horizontally and vertically in this puzzle. How many can you find?

Hopefully, by the time you complete the supplement, many of these words — and the strategies they represent — will be familiar to you.

PROBLEM-SOLVING WORDS

SOLUTION
VISUALIZE
THINK
INFER
IRRELEVANT
STRATEGIES
SELFQUESTION
UNDERSTAND
PERCEPTION
CHART
GRID
EXPERIMENT
INTERPRET
SEQUENCE
CREATIVITY
JUDGE
INPUT
PROCESSING
OUTPUT
BRAINSTORM
SCAMPER
CAUSEANDEFFECT
PATTERN
PLAN
REFLECTION
OBSERVATION
GRAPH
BIAS
ORGANIZE
ANALYZE
HYPOTHESIZE
PREDICT
INFORMATION
LOGICAL

A	S	C	A	M	P	E	R	V	A	N	A	L	Y	Z	E	W	X	I
B	G	H	J	S	T	U	O	U	T	P	U	T	A	R	Q	O	E	N
C	P	A	T	T	E	R	N	Y	Z	S	T	U	B	V	H	P	F	T
D	I	R	R	E	L	E	V	A	N	T	W	X	C	Y	Y	S	G	E
E	H	T	K	L	P	N	P	L	A	N	A	U	D	Z	P	E	H	R
F	I	R	L	M	Q	O	S	L	O	G	I	C	A	L	O	Q	I	P
B	R	A	I	N	S	T	O	R	M	D	B	V	C	I	T	U	J	R
U	K	T	M	V	P	E	R	C	E	P	T	I	O	N	H	E	K	E
R	E	F	L	E	C	T	I	O	N	E	X	W	X	P	E	N	L	T
W	Z	J	N	Z	V	Y	I	Y	F	K	L	S	T	U	S	C	M	A
S	O	L	U	T	I	O	N	M	N	G	J	I	G	T	I	E	N	O
T	I	G	O	H	S	W	F	X	H	Y	U	Z	R	Q	Z	R	C	R
R	F	H	P	U	U	I	E	K	J	I	N	I	A	F	E	P	R	G
A	G	E	Q	J	A	V	R	L	J	M	D	H	P	G	P	R	E	A
T	D	F	R	T	L	K	W	N	V	K	E	R	H	N	H	E	A	N
E	E	C	T	H	I	N	K	Y	O	G	R	I	D	J	O	D	T	I
G	B	D	L	R	Z	N	P	P	L	T	S	S	G	A	J	I	I	Z
I	C	A	S	M	E	Q	O	X	Q	M	T	F	B	I	U	C	V	E
E	X	P	E	R	I	M	E	N	T	Y	A	Z	I	H	D	T	I	B
S	E	L	F	Q	U	E	S	T	I	O	N	G	A	B	G	K	T	M
I	N	F	O	R	M	A	T	I	O	N	D	F	S	E	E	L	Y	N
B	C	O	B	S	E	R	V	A	T	I	O	N	D	Q	T	E	C	O
A	B	A	P	R	O	C	E	S	S	I	N	G	R	S	D	U	P	D
C	A	U	S	E	A	N	D	E	F	F	E	C	T	C	V	W	E	X